LISTING OF CLAIMS

Claims 22-47 are pending and are rejected. By this Amendment, claims 23-47 are canceled without prejudice or disclaimer. Claim 22 is amended and new claims 76-86 are added.

1. (Withdrawn) A radiation image acquisition apparatus, comprising:

a sensor for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object; and

a scattered ray removing grid for removing scattered rays from said object,

wherein an interval of elements of said scattered ray removing grid is set such that a spatial frequency of a stripe pattern, in said image, which originates from said scattered ray removing grid becomes not less than 1/3 and not greater than 40% of a sampling frequency that is a reciprocal of said spatial sampling interval.

2. (Withdrawn) The apparatus according to claim 1, wherein said scattered ray removing grid is used without being moved during acquisition of said image by said sensor.

3. (Withdrawn) The apparatus according to claim 1, further comprising an image processing unit for removing said stripe pattern which originates from said scattered ray removing grid by filtering said image.

4. (Withdrawn) The apparatus according to claim 3, wherein said image processing unit performs said removing in accordance with operation performed by an operator.

5. (Withdrawn) The apparatus according to claim 3, wherein said image processing unit performs said removing in accordance with an application purpose of said image.

6. (Withdrawn) The apparatus according to claim 5, wherein said image processing unit performs said removing if the purpose is to perform spatial frequency emphasis processing for said image.

7. (Withdrawn) The apparatus according to claim 5, wherein said image processing unit performs no said removing if the purpose is to perform display or hard copy operation of said image on a scale not less than 100%.

8. (Withdrawn) The apparatus according to claim 5, wherein said image processing unit performs said removing if the purpose is to perform display or hard copy operation of said image upon reduction of said image.

9. (Withdrawn) The apparatus according to claim 5, wherein said image processing unit performs no said removing if the purpose is to store said image.

10. (Withdrawn) The apparatus according to claim 3, wherein said image processing unit performs said removing in accordance with a portion to be imaged of said object.

11. (Withdrawn) The apparatus according to claim 10, wherein said image processing unit performs no said removing if the portion is a bone portion.

12. (Withdrawn) The apparatus according to claim 10, wherein said image processing unit performs no said removing if the portion is a pelvis or joint portion.

13. (Withdrawn) The apparatus according to claim 10, wherein said image processing unit performs said removing if the portion is a chest or abdominal portion.

14. (Withdrawn) The apparatus according to claim 3, wherein said image processing unit performs said removing in accordance with an amplitude of said stripe pattern.

15. (Withdrawn) The apparatus according to claim 14, wherein said image processing unit performs said removing if the amplitude of said stripe pattern is larger than a predetermined threshold.

16. (Withdrawn) A radiation image acquisition method of spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an

image of said object using a sensor and a scattered-ray removing grid for removing scattered rays from said object, comprising:

setting an interval of elements of said scattered ray removing grid such that a spatial frequency of a stripe pattern, in said image, which originates from said scattered ray removing grid becomes not less than 1/3 and not greater than 40% of a sampling frequency that is a reciprocal of said spatial sampling interval.

17. (Withdrawn) The method according to claim 16, wherein said scattered ray removing grid is used without being moved during acquisition of said image by said sensor.

18. (Withdrawn) A radiation image acquisition apparatus, comprising:

a sensor for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object; and

a scattered ray removing grid for removing scattered rays from said object, wherein an interval of elements of said scattered ray removing grid is set such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within $fs(n+1/3) \sim fs(n+0.4)$ or $fs(n+0.6) \sim fs(n+2/3)$, where $1/fs$ is said spatial sampling interval and n is an integer not less than 0.

19. (Withdrawn) The apparatus according to claim 18, wherein said scattered ray removing grid is used without being moved during acquisition of said image by said sensor.

20. (Withdrawn) A radiation image acquisition method of spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using a sensor and a scattered ray removing grid for removing scattered rays from said object, comprising:

setting an interval of elements of said scattered ray removing grid such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is

within $fs(n+1/3) \sim fs(n+0.4)$ or $fs(n+0.6) \sim fs(n+2/3)$, where 1/fs is said spatial sampling interval and n is an integer not less than 0.

21. (Withdrawn) The method according to claim 20, wherein said scattered ray removing grid is used without being moved during acquisition of said image by said sensor.

22. (Currently Amended) A radiation image ~~acquisition~~ sensing apparatus, comprising:

~~an image acquisition unit for spatially sampling a radiation transmission distribution of an object to be imaged through a scattered ray removing grid for removing scattered rays from said object at a spatial sampling interval and acquiring an image of said object;~~

a radiation tube for radiating radiation;

a sensor for converting the radiation to an image data;

a grid arranged in front of said sensor;

an input unit for inputting a part information of an object which is an information concerning to a part of the object to be sensed;

an image processing unit for ~~removing a stripe pattern originating from said scattered ray removing~~ performing a grid removing processing that removes a grid image from ~~said~~ the image data ~~by image processing~~; and

~~a selection unit for allowing selection between removal and nonremoval of said stripe pattern by using said image processing unit, wherein the selection is performed in accordance with an application purpose~~

a determination unit for determining whether or not the grid removing processing should be performed for the image data, based on the part information.

23. (Canceled)

24. (Canceled)

25. (Canceled)

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Canceled)

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31. (Canceled)

32. (Canceled)

33. (Canceled)

34. (Canceled)

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37. (Canceled)

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39. (Canceled)

40. (Canceled)

41. (Canceled)

42. (Canceled)

43. (Canceled)

44. (Canceled)

45. (Canceled)

46. (Canceled)

47. (Canceled)

48. (Withdrawn) A design method of designing at least one of a sensor and a scattered ray removing grid used for an apparatus for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using said sensor and said scattered ray removing grid for removing scattered rays from said object, comprising:

determining at least one of an interval of elements of said scattered ray removing grid and said spatial sampling interval of said sensor such that a spatial frequency of a stripe pattern, in said image, which originates from said scattered ray removing grid becomes not less than 1/3 and not greater than 40% of a sampling frequency that is a reciprocal of said spatial sampling interval.

49. (Withdrawn) A design method of designing at least one of a sensor and a scattered ray removing grid used for an apparatus for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using said sensor and said scattered ray removing grid for removing scattered rays from said object, comprising:

determining at least one of an interval of elements of said scattered ray removing grid and said spatial sampling interval of said sensor such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within fs (n+1/3) ~fs(n+0.4) or fs(n+0.6) ~ fs(n+2/3), where 1/fs is said spatial sampling interval and n is an integer not less than 0.

50. (Withdrawn) A radiographic apparatus, comprising:

a sensor for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object; and

a grid for reducing scattered radiation from said object, wherein a sampling frequency Fs of said sensor as a reciprocal of the spatial sampling interval and a spatial frequency Fg of said grid as a reciprocal of an interval of shades of elements of said grid on an image-receiving surface of said sensor substantially satisfy $Fg = j \cdot Fs/3$, where j is a positive integer except for multiples of three.

51. (Withdrawn) The apparatus according to claim 50, wherein the frequency Fs falls within a range of 5 to 10 cyc/mm, and j is two.

52. (Withdrawn) The apparatus according to claim 50, further comprising an image processing unit for removing an image component originating from said grid from the image.

53. (Withdrawn) The apparatus according to claim 50, wherein said sensor has a pixel adding function of multiplying the spatial sampling interval by a natural number except for a multiple of three.

54. (Withdrawn) The apparatus according to claim 50, wherein said sensor is a direct sensor for directly converting the radiation transmission distribution into a charge distribution.

55. (Withdrawn) The apparatus according to claim 50, wherein said sensor is an indirect sensor for converting the radiation transmission distribution into a light intensity distribution by using a phosphor and converting the light intensity distribution into a charge distribution.

56. (Withdrawn) The apparatus according to claim 50, wherein the frequency Fs and the frequency Fg substantially satisfy

$$\frac{\left\|J_1Fs - Fg\right| - \left|j_2Fs - 2Fg\right\|}{\frac{1}{3}Fs} \leq 0.05$$

with j_1 and j_2 being so selected as to satisfy $h_iFs - Fgl < Fs/2$ and $h_2Fs - 2FgI < Fs/2$.

57. (Withdrawn) A radiographic method of spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval by using a sensor and a grid for reducing scattered radiation from said object, and acquiring an image of said object, comprising:

acquiring an image of said object such that a sampling frequency Fs of said sensor as a reciprocal of the spatial sampling interval and a spatial frequency Fg of said grid as a reciprocal of an interval of shades of elements of said grid on an image-receiving surface of said sensor substantially satisfy $Fg = j \cdot Fs/3$, where j is a positive integer except for multiples of three.

58. (Withdrawn) The method according to claim 57, wherein the frequency Fs falls within a range of 5 to 10 cyc/mm, and j is two.

59. (Withdrawn) The method according to claim 57, wherein the frequency Fs and the frequency Fg substantially satisfy

$$\frac{\left\|J_1Fs - Fg\right| - \left|j_2Fs - 2Fg\right\|}{\frac{1}{3}Fs} \leq 0.05$$

with j_1 and j_2 being so selected as to satisfy $Ij_1Fs - Fg) < Fs/2$ and $Ij_2Fs - 2Fgl < Fs/2$.

60. (Withdrawn) A design method of designing at least one of a sensor and a grid used for a radiographic apparatus for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using said sensor and said grid for reducing scattered rays from said object, comprising:

determining at least one of the spatial sampling interval of said sensor and an interval of elements of said grid such that a sampling frequency Fs of said sensor as a reciprocal of the spatial sampling interval and a spatial frequency Fg of said grid as a reciprocal of an interval of shades of elements of said grid on an image-receiving surface of said sensor substantially satisfy $Fg = j \cdot Fs/3$, where j is a positive integer except for multiples of three.

61. (Withdrawn) A radiation image acquisition apparatus, comprising:

a sensor for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object; and

a scattered ray removing grid for removing scattered rays from said object, wherein an interval of elements of said scattered ray removing grid is set such that a spatial frequency of a stripe pattern, in said image, which originates from said scattered ray removing grid becomes not greater than 40% of a sampling frequency that is a reciprocal of said spatial sampling interval.

62. (Withdrawn) The apparatus according to claim 61, wherein the spatial frequency of the stripe pattern becomes not less than 25% of the sampling frequency.

63. (Withdrawn) The apparatus according to claim 61, wherein the spatial frequency of the stripe pattern becomes not less than 30% of the sampling frequency.

64. (Withdrawn) A radiation image acquisition method of spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using a sensor and a scattered ray removing grid for removing scattered rays from said object, comprising:

setting an interval of elements of said scattered ray removing grid such that a spatial frequency of a stripe pattern, in said image, which originates from said scattered ray removing

grid becomes not greater than 40% of a sampling frequency that is a reciprocal of said spatial sampling interval.

65. (Withdrawn) The method according to claim 64, wherein the spatial frequency of the stripe pattern becomes not less than 25% of the sampling frequency.

66. (Withdrawn) The method according to claim 64, wherein the spatial frequency of the stripe pattern becomes not less than 30% of the sampling frequency.

67. (Withdrawn) A radiation image acquisition apparatus, comprising:

a sensor for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object; and

a scattered ray removing grid for removing scattered rays from said object, wherein an interval of elements of said scattered ray removing grid is set such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within fs(n+0.25) ~fs(n+0.4) or fs (n+0. 6) ~ fs (n+0.75) , where 1/fs is said spatial sampling interval and n is an integer not less than 0.

68. (Withdrawn) A radiation image acquisition apparatus, comprising:

a sensor for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object; and

a scattered ray removing grid for removing scattered rays from said object,

wherein an interval of elements of said scattered ray removing grid is set such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within fs(n+0.3) ~. fs(n+0.4) or fs (n+0. 6) ~fs (n+0. 7) , where 1/fs is said spatial sampling interval and n is an integer not less than 0.

69. (Withdrawn) A radiation image acquisition method of spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using a sensor and a scattered ray removing grid for removing scattered rays from said object, comprising:

setting an interval of elements of said scattered ray removing grid such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within $fs(n+0.25) \sim fs(n+0.4)$ or $fs(n+0.6) \sim fs(n+0.75)$, where $1/fs$ is said spatial sampling interval and n is an integer not less than 0.

70. (Withdrawn) A radiation image acquisition method of spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using a sensor and a scattered ray removing grid for removing scattered rays from said object, comprising:

setting an interval of elements of said scattered ray removing grid such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within $fs(n+0.3) \sim fs(n+0.4)$ or $fs(n+0.6) \sim fs(n+0.7)$, where $1/fs$ is said spatial sampling interval and n is an integer not less than 0.

71. (Withdrawn) A design method of designing at least one of a sensor and a scattered ray removing grid used for an apparatus for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using said sensor and said scattered ray removing grid for removing scattered rays from said object, comprising:

determining at least one of an interval of elements of said scattered ray removing grid and said spatial sampling interval of said sensor such that a spatial frequency of a stripe

pattern, in said image, which originates from said scattered ray removing grid becomes not greater than 40% of a sampling frequency that is a reciprocal of said spatial sampling interval.

72. (Withdrawn) The method according to claim 71, wherein the spatial frequency of the stripe pattern becomes not less than 25% of the sampling frequency.

73. (Withdrawn) The method according to claim 71, wherein the spatial frequency of the stripe pattern becomes not less than 30% of the sampling frequency.

74. (Withdrawn) A design method of designing at least one of a sensor and a scattered ray removing grid used for an apparatus for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using said sensor and said scattered ray removing grid for removing scattered rays from said object, comprising:

determining at least one of an interval of elements of said scattered ray removing grid and said spatial sampling interval of said sensor such that a spatial frequency that is a reciprocal of said interval of elements of said scattered ray removing grid is within fs(n+0.25) ~fs(n+0.4) or fs(n+0.6) ~ fs (n+0.75) , where 1/fs is said spatial sampling interval and n is an integer not less than 0.

75. (Withdrawn) A design method of designing at least one of a sensor and a scattered ray removing grid used for an apparatus for spatially sampling a radiation transmission distribution of an object to be imaged at a spatial sampling interval and acquiring an image of said object using said sensor and said scattered ray removing grid for removing scattered rays from said object, comprising:

determining at least one of an interval of elements of said scattered ray removing grid and said spatial sampling interval of said sensor such that a spatial frequency that is a reciprocal of said

interval of elements of said scattered ray removing grid is within fs(n+0.3) ~fs(n+0.4) or fs(n+0.6) ~fs(n+0.7), where 1/fs is said spatial sampling interval and n is an integer not less than 0.

76. (New) A radiation image sensing apparatus, comprising:

a radiation tube for radiating radiation;

a sensor for converting the radiation to an image data;

a grid arranged in front of said sensor;

a first image processing unit for performing a grid removing processing that removes a grid image from the image data;

a second image processing unit for performing a spatial frequency processing that detects a spatial frequency of the image data; and

a determination unit for determining whether or not the grid removing processing should be performed for the image data, based on the spatial frequency.

77. (New) A radiation image sensing apparatus, comprising:

a radiation tube for radiating radiation;

a sensor for converting the radiation to an image data;

a grid detachably arranged in front of said sensor;

an image processing unit for performing a grid removing processing that removes a grid image from the image data; and

a determination unit for performing a spatial frequency analysis for the image data and determining whether or not the grid is attached in front of said sensor on the basis of a spectrum amplitude of a frequency band corresponding to the grid image,

wherein said image processing unit performs the grid removing processing when it is determined that the grid is attached in front of said sensor by said determination unit.

78. (New) A radiation image sensing apparatus, comprising:

a radiation tube for radiating radiation;

a sensor for converting the radiation to an image data;

a grid arranged in front of said sensor;

a first image processing unit for performing a grid removing processing that removes a grid image from the image data;

a second image processing unit for calculating a magnitude of a contrast of the grid image; and

a determination unit for determining whether or not the contrast of the grid image is larger than a predetermined value,

wherein said image processing unit performs the grid removing processing when it is determined that the contrast of the grid image is larger than the predetermined value by said determination unit.

79. (New) A control method of a radiation image sensing apparatus which has a radiation tube for radiating radiation, a sensor for converting the radiation to an image data, and a grid arranged in front of said sensor, said method comprising the steps of:

inputting a part information of an object which is an information concerning a part of the object to be sensed;

determining whether or not a grid removing processing that removes a grid image from the image data should be performed, based on the part information; and

performing the grid removing processing based on a result of said determining step.

80. (New) A control method of a radiation image sensing apparatus which has a radiation tube for radiating radiation, a sensor for converting the radiation to an image data, and a grid arranged in front of said sensor, said method comprising the steps of:

performing a spatial frequency processing that detects a spatial frequency of the image data;

determining whether or not a grid removing processing that removes a grid image from the image data should be performed, based on the spatial frequency; and

performing a grid removing processing based on a result of said determining step.

81. (New) A control method of a radiation image sensing apparatus which has a radiation tube for radiating radiation, a sensor for converting the radiation to an image data, and a grid detachably arranged in front of said sensor, said method comprising the steps of:

performing a spatial frequency analysis for the image data and determining whether or not the grid is attached in front of said sensor on the basis of a spectrum amplitude of a frequency band corresponding to a grid image; and

performing a grid removing processing that removes the grid image from the image data when it is determined that the grid is attached in front of said sensor in said determination step.

82. (New) A control method of a radiation image sensing apparatus which has a radiation tube for radiating radiation, a sensor for converting the radiation to an image data, and a grid arranged in front of said sensor, said method comprising the steps of :

calculating a magnitude of a contrast of a grid image;

determining whether or not the contrast of the grid image is larger than a predetermined value; and

performing a grid removing processing that removes the grid image from the image data when it is determined that the contrast of the grid image is larger than the predetermined value in said determination step.

83. (New) A computer program adapted to cause a computer to perform the method according to claim 79.

84. (New) A computer program adapted to cause a computer to perform the method according to claim 80.

85. (New) A computer program adapted to cause a computer to perform the method according to claim 81.

86. (New) A computer program adapted to cause a computer to perform the method according to claim 82.